

## ABSTRACT OF DISCLOSURE

A computer-implemented method for optimizing the design of an electromagnetic coil arrangement that generates a uniform magnetic field in a desired region, with the electromagnetic coil arrangement having a number of coils and a shape defined by  $r$  and  $z$ ,  
5 where  $r$  is the radial coordinate of a cylindrical coordinate system having  $(r, z, \phi)$  coordinates, and  $z$  is the axial coordinate of the cylindrical coordinate system. The method has an important use for designing superconductive or resistive coil arrangements for MRI systems. The core of the method is to compute a solution to a master equation (25) for a set  
10 of parameters  $\lambda_j$  which define the coil arrangement and the currents needed. An important advantage is that the resultant coil arrangement has a minimum volume, which saves on material, or uses a minimum power.